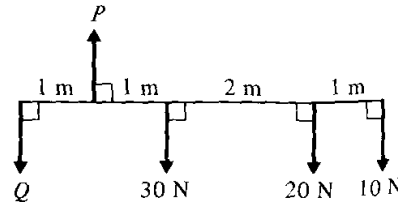


Mechanics 4 – Forces 1

Please **complete** this homework by _____. Start it early. If you can't do a question you will then have time to ask your teacher for help or go to a drop in session.

Section 1 – Review of previous topics. Please complete all questions.

1. The forces in the diagram opposite are in equilibrium. Find the values of P and Q.



2. A uniform plank AB, of mass 28Kg and length 9m, lies on a horizontal roof in a direction at right angles to the edge of the roof. The end B projects 2m over the edge. A man of mass 70Kg walks out along the plank.

a) Find how far along the plank he can walk without causing the plank to tip up.

b) Find also the mass which must be placed on the end A so that the man can reach B without upsetting the plank.

3. It is reported in the news that teenagers use social media for a long time each day. A random sample of 11 students were interviewed and asked how long they spent using social media in an average week.

The total duration, in minutes, for the 11 students were:

7, 98, 121, 132, 151, 187, 204, 255, 260, 277, 357 (OUTLIERS: $Q_1 - 1.5 \times IQR$, $Q_3 + 1.5 \times IQR$)

a. Find the median and quartiles for these data.

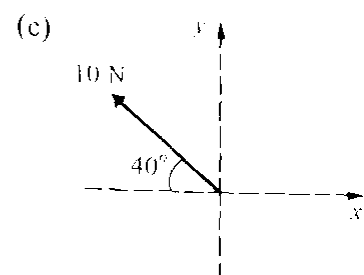
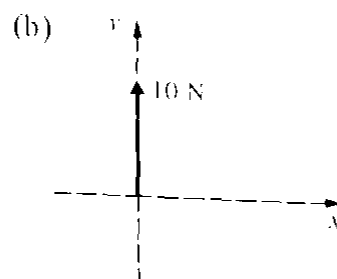
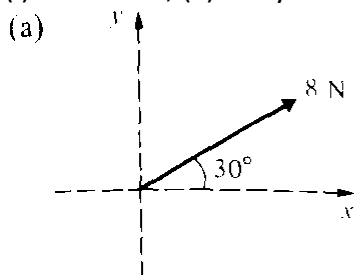
b. Show that there are no outliers.

4. A light inextensible string passes over a smooth fixed pulley and carries freely hanging masses of 6Kg and 4Kg at its ends. Find the acceleration of the system and the tension in the string.

Section 2 – Consolidation of this week's topic. Please complete all questions.

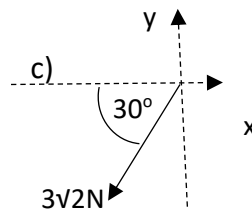
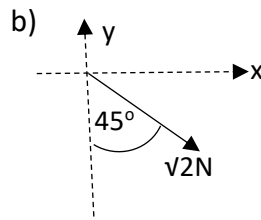
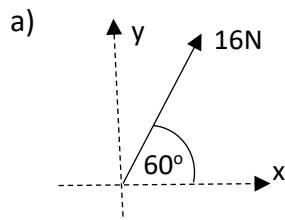
1. For each of the forces below, find the components in the direction of (i) the x axis, (ii) the y axis.

(6)

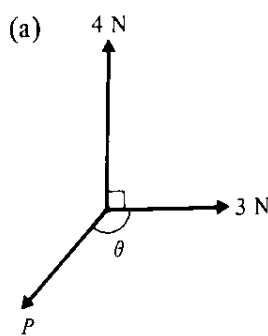


2. Express each of the following forces in the form $ai + bj$.

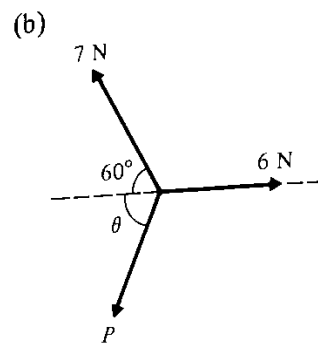
(6)



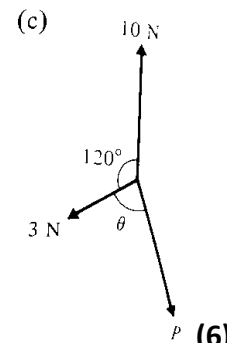
3. Each of the following systems of forces are in equilibrium. By making a sketch of the triangle of forces or otherwise, hence calculate the magnitude of force P and the size of angle θ .



(5)

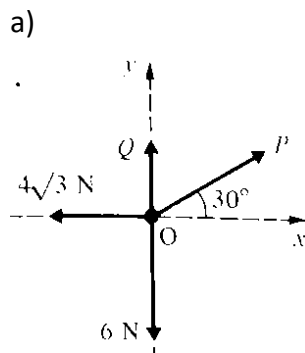


(6)

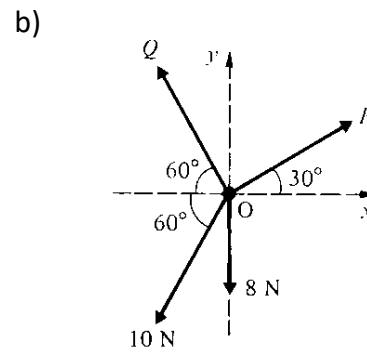


(6)

4. Each of the diagrams below shows a particle in equilibrium. In each case find the values of forces P and Q by resolving forces in the direction of the x axis and y axis.



(9)



(12)

5. A light inextensible string of length 50 cm has its upper end fixed at point A and carries a particle of mass 8 kg at its lower end. A horizontal force P applied to the particle keeps it in equilibrium 30 cm from the vertical through A. By resolving vertically and horizontally find the magnitude of P and the tension in the string.

(10)

Total Marks 60